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Foresight Methods in Pedagogical Design of University Learning Environment

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ABSTRACT

Currently, informational-educational environment has become one of the constitutive tendencies in the development of modern education and correlates with IT development in all spheres of human life. The availability of multiple possibilities for using information and communication technologies in education brings about variability in university learning environment design. The authors propose the use of foresight methodology to optimize educational content and structure didactic potential of learning environment. The mechanism of pedagogical design using foresight methodology is based on accommodation of subjective views of stakeholders in the education system, creation of a common vision of the informational and educational environment which involves objective prognostic information and the trends and tendencies in regional education development. The knowledge gained from foresight methodology made it possible to design informational and educational, or learning, environment at the university that is able to ensure the learning process meeting the expectations of all stakeholders as close as it is possible and affect the employment rate of the university graduates.

Keywords: higher education, ICT, learning environment, foresight methods, forecasting, pedagogical design

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State of the literature

- Due to IEE application variability a higher education institution has worked out a variety of IEE designing concepts.
- Redundancy of educational information and its insufficient didactic structuring significantly reduce the productivity of information and educational resources.
- Participation of education stakeholders in learning process organization and design, study of educational needs contributing to motivation in learning, alignment of learning outcomes with the requirements of the labour market.

Contribution of this paper to the literature

- Foresight methods are proposed to identify higher education trends at the regional level.
- The mechanism of coordinating stakeholders' requirements and expectations to design IEE for higher education institutions has been developed.
- Higher education IEE structure has been considered as an open pedagogical system capable of implementing learning and managing functions in education.

INTRODUCTION

The increasing pace of modern development has led to the radical change in attitudes toward higher education. Today we consider any kind of education prognostic, or forward-looking, that is based on the trends of social, cultural and economic development. University graduates are suggested to have essential skills and competencies required to successfully accomplish their job tasks, should be able to understand and adapt to ever-changing realities of the world. These are considered to be the conditions when functions, values and meanings, learning activities, organizational formats and university educational technologies are transforming.

This fact requires us to revise our viewpoints on how we teach and learn, critically look at educational technologies and arrange educational environment so that it can contribute to the development of future professionals through their abilities to act relatively independently (with support or consulting) in their learning from knowledge acquisition to knowledge production, which involves search, development and production of information (Khodyakova, 2012; Jasvin, 2001; Manuilov, 2002; Slobodchikov, 2000; Leontieva, 2009; Shaidullina, et al., 2015). Recently, formation of informational-and-educational environment (IEE) has become one of the defining trends of modern education, thus creating key conditions for developing individual pathways for personal development (Robert, Panyukova & Kuznetsov, 2008; Bell & Newton, 2013; Voogt et all, 2015; Shesternin, 2014; Ostroumova, 2011; Khairullina et al., 2016; Sakhieva et al., 2015).

However, multiple approaches developed in designing IEE have revealed a number of contradictions:

1) the contradiction between the necessity to make IEE universal and accessible, and the need to take regional requirements as well as sociocultural factors affecting the quality of higher education teaching and learning traditions into consideration;
2) the contradiction between high didactic potential of ICT and inadequate investigation of the needs in educational process development;
3) the contradiction between the excessive number of electronic educational resources (presentations, lecture materials, video resources, etc.) and their low pedagogical effectiveness in independent student leaning;
4) the contradiction between the level of mastering ICT by teachers and students (i.e. sometimes teachers learn a bit slower than the younger generation).

The contradictions identified lead us to the need of designing a university IEE with didactically structured information content, taking into account local conditions, high level of training material, its methodical structure,

the quality of training and its compliance with educational standards in order to offer students advanced scientific and educational information necessary to develop their professional skills and competences.

Our *purpose of study* was to develop methods and tools for designing IEE aimed at promoting prognostic formation of professional competencies.

To achieve this purpose, it is necessary to solve the following research tasks:

1) identify foresight methods capabilities to reconcile interests of education stakeholders;
2) determine the university IEE function for each education stakeholder;
3) develop a mechanism of coordinating stakeholders' interests;
4) bring stakeholders' demands and expectations about IEE at a higher education institution into line and carry out IEE design.

MATERIALS AND METHODS

The experiment involved stakeholders of The Peoples' Friendship University of Russia (Design and Technological Support for Engineering Industry, Organization and Management of Manufacturing Business, Ecology and Natural Resources Management). They were representatives of the Student Council of the university (the most active students), the students of experimental groups and teachers engaged in teaching them, heads of divisions and departments of the university, employer representatives (experts), representatives of scientific community (psychology, pedagogy, ICT). All in all, there were more than 500 people involved into the experiment.

Functions and Tasks of the Modern University IEE

We consider a university IEE as a pedagogical system that combines informational and educational content, tools for managing student learning activity, pedagogical techniques and methods to develop a socially important creative individual with all necessary professional competences. This system uses educational environment that depends on the infrastructure created, its functions and capabilities adequate to modern social theory and practice, provides a methodological foundation for accumulating experience through learning activities in the information environment (Levin, 2000; Kolesnikova, 2013).

IEE meeting all the above mentioned requirements should:

- *for a university student:* provide the targeted development of independent cognitive activity, contribute into the process of obtaining new knowledge and experience comprising planning, management and development of academic and professional activities, provide effective feedback, diagnostics and correction of student learning, a wide range of incentives for personal and professional self-development;
- *for university teaching staff:* implement pedagogical control of learning activities that would meet the new requirements, provide direct educational communication (teacher-student, teacher-student group, student-student); assist in the procedure of selecting learning content based on cultural traditions (as part of social experience) and personality-oriented models (personal experience is considered as a content element); ensure the predominance of learning over teaching i.e. a student-centered approach; facilitate and ensure students' acquisition of competences and experience to be used in solving professional issues;
- *for university administration (departments, faculties):* structure information data sets, their analysis and arrangement, continuously monitor educational activities, increase the quality of educational activity management, contribute to continuous improvement of higher education quality.

Hence, IEE is considered as an open pedagogical system implementing not only training but also management of academic process and its quality, and includes the following main components:

1) *goal*, the component that generates the set of integrated goals of all stakeholders (learner, society, employer, university, government);
2) *methodology*, creates regulatory framework for training i.e. the standard training curriculum, a course syllabus, tools for working out the individual trajectory of one's learning as it develops over the course of education;
3) *course content* to transfer the knowledge to learners, the cognitive basis to develop their professional competencies: course books and manuals, electronic course books, reference books, lecture materials, presentation materials, multimedia presentations, demonstration materials, video, etc.;
4) *functional component,* used to perform activities, develop skills and competences, i.e. a set of educational technologies and teaching methods;
5) *communication*, contributing to learning process management, ensuring educational and professional interaction and providing pedagogical support to educational activities;
6) *management,* regulating learning process in the framework of the IEE, control of learning activities outcomes, providing quality management in education, support and management in making decisions to improve all the components of IEE.

The Potential of Foresight Methods to Design IEE

The main challenge in designing a modern IEE is, in our opinion, the task of optimizing training content, so that it was not overloaded with multimedia information, and means for student activities management for students' better professional and personal development.

Considering educational activities as a social process where the qualitative result (output) is significant for all stakeholders of education we believe it is necessary to use foresight methodology because it allows to compare forecasts and strategies of higher education development in a certain region, as well as personal strategies for professional development of students, determine pedagogical objectives and their implementation through IEE. Usually this method is used in social and economic sciences to reduce the uncertainty in the systems under study through forecasting and developing possible future strategies (Hayward, 2005; Glenn & Gordon, 2009; Gaponenko, 2010; Goux-Baudiment, 2016). In fact, foresight is a social technology, the communication format that allows participants to agree on a vision of the future, define the desired image of the future and agree on actions in its context framework. In fact, this idea suggests that the basis for assessing the future alternatives is made up by experts participating in the projects, active and purposeful use of their knowledge (Danyluk&Kulikov, 2008; Dibrova, 2014).

Foresight projects include two aspects: 1) the probabilities generated by essential or objective stochasticity and randomness of events or unpredictable series of events and system conditions; 2) multiparameter and multifactorial nature of complex systems may be slowly simplified in practical cognition

A foresight method is based on the principle that the future depends on the efforts made, it is variable and is not a projection of the past. If the future cannot be accurately predicted then organisations should make more effective use of foresight techniques including trend analysis and scenario planning, and build competencies for real-time responsiveness and shaping the future through action, as in the aphorism, "If you want to predict the future you have to create it." However, we cannot deny the fact that the future cannot be foreseen for sure.

It should be noted that in principle educational needs of a person may differ considerably from public demands in education, so it is important to harmonize a person and social purposes of education (Levina, 2015; Gao et al., 2017). Such coordination is possible within the overall design procedure, a kind of "vector fields" (Levin, 200) formed by society demands and personal needs both participating in learning environment creation. It's in the learning environment where interaction of different orientation and intensity takes place, social and cultural experiences are gained, i.e. it qualitatively affects the effectiveness of university educational activities.

Typically, a combination of different methods (including Expert Panels, Delphi, SWOT-Analysis, Brainstorming, Scenarios, Roadmapping, Relevance Tree, Cross-Impact, etc.) is used in a project with foresight methodology. What is special is that it involves a large number of experts to discuss the task (Amsteus, 2008; Gao

and Wang, 2017). In our case, they are the numerous participants of the educational process represented by students, teaching staff, scientific community, education institutions authorities and employers. This will provide multilateral assessment of a university IEE as a predictable process and choose the most optimal variant of the project implementation.

Foresight comes from variants of the future possible under certain conditions: the correct determination of development scenarios, a consensus when choosing a desirable scenario, and measures taken for its implementation. Another feature is that it is based on collective opinion, i.e. designing the future through the unified and coherent experience of people professionally interested in changing the future, participating in the development of the main strategies and development goals to create the future.

The benefits of a foresight method that are taken into account for a certain university IEE success are the following:

- generation and expanded reproduction of interdisciplinary knowledge (sociological, administrative, philosophical, pedagogical, psychological, economic, informational);
- active use of the intellectual potential of all participants having educational relationships at the stage of collecting and accumulating information and its further use to make decisions and joint actions;
- strategic and competitive advantages of a higher education institution in the framework of planning its outcomes;
- consideration of possible risks in social, cultural, economic, technological and psychologic-and-pedagogic areas;
- focus on enhancing the quality of higher education with the temporary backlash that may ensure employability of graduates and increase their contribution to socio-economic development of society.

Foresight cannot solve all a region's social, economic or political problems and it should not be looked upon as a "quick fix". Foresight sets out to generate visions which will be driven by an understanding of relevant social changes and/or technological developments. Constraining factors for using a foresight method in the design of IEE for a local higher educational institution are the following:

- resources available (technological, economic);
- copyright compliance and security requirements for IEE;
- information openness of education;
- urgency for foresighting (not more than 5 years) for modern educational and social and cultural conditions.

Foresight Method Application in the Design of a University IEE

On the basis of all participants interests (stakeholder approach) the priority of their interaction in the design of university IEE has been determined. Foresight, unlike most approaches to strategic planning, deals with long-term prospects, and draws upon the views of multiple stakeholders. The latter has been considered an essential element that is able to lead to sustainable development of the educational system, its self-management and self-development of students. It made it possible to include a foresight method into the development process of IEE, identify opportunities for effective participation of education stakeholders in the area of coordination of their opinions and expectations, agreeing on the issues of their views concerning the future of education and its outcomes at the university.

On the whole, a foresight method to design the University IEE can be represented in the following scheme (**Table 1**).

Table 1. Foresight method algorithm used to design a university IEE

Stage 0	***Components***			
	Formulating goals and objectives for the study	Justification of prerequisites	Formation of expert groups	Design constraint analysis
Stage 1	***Components***			
	Study of the driving forces in education	Study of global and local educational trends	Study of requirements for learning outcomes	
Stage 2	***Components***			
	Comparing of educational trends and their analysis	Ranking of education trends on the local level	Study of risks and implementation opportunities	
Stage 3 (two-round)	***Components***			
	Selection of visions on IEE in pedagogic community	Targeted IEE format design	Defining pedagogic requirements to IEE composition	Simulation of IEE pedagogic model
Stage 4	***Components***			
	Study of students' values and motives	Selection of outcome-based visions on IEE	Defining students' requirements in the format of the IEE design	Educational communication in the structure of IEE
Stage 5	Comparing IEE formats	Considering strengths of IEE	Simulation of scenario models for IEE	Considering and comparing stakeholders' requirements and visions on IEE model
Stage6	***Components***			
	IEE goals related to stakeholders' attitude to IEE	IEE objectives related to stakeholders' attitude to IEE	IEE content related to stakeholders' attitude to IEE	Development of IEE concept model related to stakeholders' attitude to IEE
Stage 7	IEE design, testing, correction			

Application of a foresight method has enabled us, as an expert group consisting of stakeholders of the Peoples' Friendship University of Russia (representatives of employers, management and teachers, students, Public Council, scientific community), to identify challenges and critical areas of the future IEE, identify current factors affecting strategies in its development, identify key trends, technology, threats, thus gradually bringing to creation of a true IEE phenomenon.

RESULTS

Design Stages of IEE Based on Foresight

Every design process is a methodical series of steps, or stages, in creating a functional product and process. Designing IEE with the use of foresight methods has gone through several stages.

At the **initial stage (0**) working groups of experts (representatives of participants in the educational process) were formed and the work to be done was planned.

At **stage 1** the university mission and strategy were studied, Brainstorming (based on advanced analysis of scientific literature, advanced domestic and foreign experience) helped to make a list of areas that would develop rapidly in the near future. While doing this, Brainstorming helped in generating ideas and none of the opinions expressed was criticized. The number of topics at this stage was unlimited. Numerous opinions and ideas from

participants were ranked, structured; the most successful were highlighted for their further practical use. This analysis allowed to identify the most popular trends in education on the local scale.

Stage 2, representatives of scientific and academic community as well as employers (experts) assessed the trends using the following criteria:

- significance for local education and specifically for the university (low, medium, high);
- effect expected from the ideas proposed (contribution to education, global issues, work to meet the needs of the people, development of intellectual resources);
- the forecasted implementation time for the trend under study;
- the scale of changes in the educational process of the university;
- risks and/or possible implementation particularities and variations (social, cultural, educational, economic).

These were then divided them into groups for and subsequent additional study, or screening.

At **stage 3** a two-round Delphi survey was carried out. At this stage, all the topics were ranked in order of their importance, thus contributing to a true feedback. The experts studied the results of the first round: the group assessment, judgment and reasoning expressed by the other members of the study. In the end, in the second round, persons who did not respond to the questions in the first round were excluded from the list of experts. A special advisory expert group held re-processing and the final ranking survey of the data was obtained.

At **stage 4**, viewpoints and visions of university students (undergraduates, post-graduates), teaching staff, and governing structures of the university were studied and assessed. They concerned:

- needs, motives, interests, value orientation in higher education generally, perceptions and expectations from IEE;
- students' interests to analytical, synthetic, experimental, inventive and others sides of educational and professional activities;
- expected methods of data representation, educational communication, interaction within educational environment.

Stage 5 was devoted to the study of data obtained from the Delphi survey and complying them with expectations earlier having been expressed by students, educators, governing structures, and requirements for learning outcomes on the part of employers. From the point of view of psychological and pedagogical positions pedagogical scenario models of IEE have been simulated taking into account the research conducted for each of the directions distinguished. After the scripts had been written, they again were discussed by the expert group in terms of their likelihood and risks associated with the use of each of them. As a result, the most probable scenarios for most suitable conditions of the university have been selected.

Stage 6 was devoted to formulating aims for educational activities and building a conceptual model for IEE on the basis of the attitude and vision of the future that most of the stakeholders supported and most of the participants agreed to.

At **stage 7** the IEE was modified and upgraded on the basis of Foresight, tested and the pilot implementation in the educational process was accomplished.

Further, following information updates and survey studies aimed at learning, if the stakeholders are satisfied with IEE results, the data are corrected. Every three years the university IEE system is planned to be upgraded using Foresight.

Here are some IEE design results obtained at the Peoples' Friendship University of Russia and information related to coordination of stakeholders' opinions:

Table 2. Graduates' employment (%)

	2013	2014	2015	2016
Employment in the occupation/job in which they have trained	37.8	41.6	53.8	59.2
Other jobs	62.2	58.4	46.2	40.8

Table 3. Graduates' quality assessed by local employers (% of respondents)

	Sufficient level of professional competences	Willingness to self-development	Communication competences	Ability to adapt fast at the work station
Positive feedback	62%	83%	72%	89%

Table 4. Students' and parents' motives for entering university

	State university	University rank and prestige	Willingness to obtain the needed skills for profession	Potential to be employed according to diploma profession
Positive feedback	92%	97%	81%	79%

Table 5. The most valuable recommendations for IEE design according to stakeholders' opinion

	University graduates having best employment opportunities	State standard requirements to university graduates	Employers' requirements to university graduates	Motivation of students in their learning	Teaching quality
Positive feedback	100%	97%	100%	92%	100%

1) *Strategic unit.* This unit comprises the data regarding the university position in the ranking of universities in the labour market, its status in society, the opinion of employers about graduates skills and competences, students' motives when they chose their future job (**Tables 2-5**).

2) *Methodological unit.* Here we evaluated the methodological components of the designed IEE, requirements and expectations of students, teachers' attitude and place in IEE integration into the university educational activities (**Table 6**).

It should be noted that IEE introduction is not as popular as it was expected to be. Teachers' positive but rather cautious attitude can be explained by conservative thinking of many of them, and what is more understandable sometimes, their cautiousness may be caused by the fact that it is not a rare thing for non-system unreasonable innovations to be introduced in university training, thus not contributing to its improvement but making it redundant in information.

At the same time, it is clear that the positive effect of IEE introduction into the university training is desirable in the abstract aspect; at least 20% of the teachers interviewed doubt the need of introducing ICT in their course. This can be attributed to the lack of information regarding the benefits of ICT. Teachers see such advantages of IEE as a fast search of information, visibility and an effective help in revising the material, user-friendly tool for computer-based testing. Still, they assess its impact on the productivity of student's learning as not more than 50%.

Table 6. Coordination of teachers' and students' attitudesto methodological organization of IEE at the university

Responds	**Questions/answers**	
	Do you think that IEE may make a significant difference in the quality of university training?	
	Teaching staff	***Students***
Yes	51%	78%
No	36%	7%
Don't know	13%	15%
Responds	How do you feel about various opportunities to use ICT in learning?	
	Teaching staff	***Students***
Positive	78%	100%
Negative	-	-
Indifferent	22%	-
Responds	Do you think it is good to increase the role of ICT in the educational process?	
	Teaching staff	***Students***
Yes	56%	86%
No	29%	-
Don't know	15%	14%
Responds	Do you think that the use of ICT is able to provide greater visibility and availability in university training?	
Yes	74%	97%
No	8%	-
Don't know	18%	3%

Our study revealed that about 86% of teachers rate their levels of proficiency related to computer skills as average. Approximately 14% consistently assess their skill as high. However, the investigation has proved that teachers in this case proceed from their personal feelings and significantly overestimate the level of their skills. Teachers have difficulties if they have to work with new software and new types of computer equipment. Almost half of the teachers states that they experience difficulties in adapting to computer upgrades in teaching. These facts necessitated the need for organizing further training of university teachers in the sphere of using ICT in teaching, work with new versions of software products used in the framework of various academic courses. ICT will enable teachers to better respond to diversity and heterogeneity in the classroom and to adapt learning material and objectives to individual students' learning needs. Teachers and trainers need to receive targeted training, enabling them to align pedagogy and technology to the benefit of their learners.

Students, on the contrary, are sure that any reference to IEE is the most acceptable way of learning, never feel new software to be too complex to study and apply or use in the learning process. They see the advantages of the shift from classical learning to personalized learning, and understand that ICT is able to change what, how, where and when people learn. They are happy to be engaged in all sorts of e-learning; 100% of students surveyed would like to have 100% of their courses computerized. In addition, students clearly understand the role of ICT in their future professional activities; they underline the need of mastering modern software products in the framework of university training.

3) *Managing Unit*. We have studied stakeholders' opinion regarding changes in the quality of education in an IEE pilot, improvements in managing university educational activities, educational management, students' self-government. The survey involved students of the experimental groups (408 2-4th- year students majoring in engineering and social-and-humanities), teachers, heads of divisions and departments that are involved in testing at the university.

The most significant results are listed in **Table 7**.

Table 7. Analysis of changes caused by introduction of IEE into learning according to students and teachers involved into the experimental groups

	Self-organization in learning	Frequency of IEE use	Control and test frequency	The need to enhance IEE
Students, positive feedback	92%	100%	100%	29%
Teaching staff, positive feedback	23%	57%	100%	12%

Thus, the students of the experimental group admit the significant role of IEE in self-organization (92%); though only 23% of teachers indicated the possibility and benefits of IEE in education management process, obviously, not fully transforming their own functions into the available opportunities of IEE.

All students use IEE in the framework of their training activities. However, teachers are significantly less rarely than students refer to reference and information systems and external resources. They prefer working with much more simple and standard programs supporting the learning process while students have confirm that they use IEE for independent learning activities. Both students and teachers highly appreciate knowledge control within IEE.

As for improving IEE, students consider it necessary to have address recommendations according to their test results (29%), a small number of educators believe it is necessary to supplement IEE with a full-featured electronic library for all courses of the specialty (11%).

Comparative analysis of teachers' and students' responds shows that there is no fundamental difference in their viewpoints regarding implementation of IEE in learning process. However, teachers were more cautious in expressing their viewpoints. The main concern voiced by them is the fact that computers can cause lack of communication between the teacher and the student.

Heads of university departments noted that IEE introduction helped to increase the students' interest and their motivation for learning, clearly increased the transparency of educational outcomes, and therefore, the opportunity of managing transformations aimed at improving the quality of learning. Each student can identify his obvious skills and knowledge, and this is what employers need.

However, there are difficulties in IEE implementation primarily caused by the attitude to information in general. For young students, it is a natural process of life, but teachers still have to change their functions, relationships, improve their skills in this area to adapt a new educational situation.

Foresight technology made a great impact on the development of the IEE design, changed favorably training conditions, and contributed to graduates' competences development. And what is more important, learning process has become as close as possible to university students' expectations and ensures self-development. For us, foresight methods used to design IEE appeared to become a comprehensive method that combines such research methods as data collection, literature analysis, strategic analysis, trends in Russian education in general, planning, forecasting, modeling, defining stakeholders' priorities and their vision and influence on the content, structure and functionality of IEE. IEE is an open system and able to build new modules that can be effectively adapted in accordance with the requirements of the quality management of education.

DISCUSSION

The efficiency of using modern ICT in education depends on the consistency of their use, optimization of the didactic component in the educational activity, and content of educational information (Smirnova, 2012; Kirilova, & Vlasova, 2014; Henner, 2014). Modern studies of the university information environment have demonstrated the need to study its dynamics and opportunities, potential for each person involved in education (Privalov, Bogatyrev & Romanov, 2017; Deng et all, 2014; Yarygin, Aniskin & Dobudko, 2014; Gusarova, 2014; Eremina, 2012). Active increase in the content of the educational environment and the expansion of its functionality

can have both positive and negative impact on the students' outcome (Levinaet all, 2016). The multiplicity of information, its heterogeneity, complication or simplification of learning styles gives rise to destructive impact which reduces the productivity of university education.

A distinctive feature of the proposed mechanism for designing a university IEE is its focus on discussion among its users, account for forecasting factors and scientific approach to training, as well as the fundamental nature of its content (Pugacheva, 2010; Bishop, 2016; Hines et all, 2016). Coordination of learning objectives from the stakeholders' standpoints and their further transformation in the educational process ensures that the design elements of IEE have all needed properties and characteristics meeting the set requirements, and are match stakeholders' expectations. The possibility to further supplement the IEE impacts its improvement and long term potential efficiency.

CONCLUSION

The hallmark of the modern educational process is the idea that university is considered as a professional development institution providing students with opportunity to work out their individual educational programs, to help them succeed at the university in accordance with their professional preferences. At the same time, implementation of government-and-public management of education involving coordination of stakeholders' expectations has an effect on their participation in IEE design. It is required to identify innovations that should qualitatively influence the university educational process. It is important to fundamentally revise the functions, value-meaning orientations, activities, organizational formats and educational technologies used at the university. In this regard, the only consistent development of professional training of students through activities leads to experiencing the mechanisms of proactive and responsible professional positions to become significant elements of educative process. To provide students with the opportunity to act relatively independently (with some extent of support) in the search and acquisition of educational information is one of the key conditions to create a successful individual educational trajectory. This work involves determining theoretical-and-technological components, technological, material, motivational, and social components.

Higher education institutions can respond to student expectations and students themselves can engage in enhancing higher education. Therefore, the content of higher education should be a dynamic construct which is constantly projected in the joint activities of teachers and educational opportunities for specific students. It should be adapted to the requirements of employers, real professional practice, and goals set in the context of the development of the entire social-economic system of the region.

REFERENCES

Amsteus, M. (2008). Managerial Foresight: Concept and Measurement. *Foresight*, *10*(1), 53–66.

Bell, T., & Newton, H. (2013). *Unplugging computer science*. New York, NY: Routledge.

Bishop, P. (2016). The University Foresight Network: The Search for Common Ground among Foresight Educators. *World Future Review*, *8*(1), 6–11.

Danyluk, A. Y., & Kulikov, I. E. (2008). Educational foresight in modern Russia. News of southern Federal University. *Pedagogical science*, *10*, 13-21.

Deng, F., Chai, C. S., Tsai, C. C., & Lee, M. H. (2014). The relationships among Chinese practicing teachers' epistemic beliefs, pedagogical beliefs and their beliefs about the use of ICT. *Journal of Educational Technology & Society*, *17*(2), 245–256.

Dibrova, J. N. (2014). Foresight as a modern practice of University management. *The scientific journal ITMO. Series "Economy and ecological management", 1*, 56-65.

Eremina, I. I. (2012). Forming information and communication competence of subjects of educational process in the conditions of information educational environment of the University. *Scientific dialogue*, (1). Retrieved from http://www.nauka-dialog.ru/pedagogika_psixologija

Gao, W., & Wang, W. F. (2017) The fifth geometric-arithmetic index of bridge graph and carbon nanocones. *Journal of Difference Equations and Applications, 23*(1-2SI), 100-109.

Gao, W., Farahani, M. R., Aslam, A., & Hosamani, S. (2017) Distance learning techniques for ontology similarity measuring and ontology mapping. *Cluster Computing - The Journal of Networks Software Tools and Applications, 20*(2SI), 959-968.

Gaponenko, N. In. (2010). Beyond the horizon: using foresight to explore the future and develop adaptive strategies. *Economic strategy*, *1-2*, 64-71.

Glenn, J. C., & Gordon, T. J. (2009). *Futures Research Methodology Version 3.0.* Washington, DC: The Millennium Project.

Goux-Baudiment, F. (2016). A Foresight Overarching Method: I. Looking for a Way to Bridge the Gap. *World Future Review*, *8*(1), 12–23.

Gusarova, M. N. (2014). The principles and theoretical bases of designing of information educational environment. *Modern problems of science and education*, (1). Retrieved from http://www.science-education.ru/115-12105

Hayward, P. (2005). *From Individual to Social Foresight*. Melbourne: Swinburne University.

Henner, E. K. (2014). Highly developed information and educational environment of the University as a condition of reforming education. *Education and science*, *1*, 54-72.

Hines, A., & Gold, J. (2013). Professionalizing Foresight: Why Do It, Where It Stands, and What Needs to Be Done. *Journal of Futures Studies, 17*(4), 35–54.

Hines, A., Gary, J., Daheim, C., & Van der Laan, L. (2016). Building Foresight Capacity: Toward a Foresight Competency Model. *World Future Review*, *8*(4), 193-196.

Jasvin, V. A. (2001). *Educational environment: from modeling to design*. Moscow: Meaning.

Khairullina, E. R., Makhotkina, L. Yu., Kiryakova, A. V., Baranov, V. V., Maksimova, O. G., Khrisanova, E. G., Piralova, O. F., & Masalimova, A. R. (2016). The real and the ideal engineer-technologist in the view of employers and educators. *International Review of Management and Marketing, 6*(1), 134-138.

Khodyakova, N. V. (2012). *Situational-environment approach to designing personal development education: methodological background and concept*. Volgograd: Peremena.

Kirilova, G. I., & Vlasova, V. K. (2014). Metadynamics of functioning of informational educational environment of a professional school. *Education and self-development*, *2*(40), 92-97.

Kolesnikova, I. A. (2013). Continuing education as a phenomenon of the XXI century: new perspectives of research. *Lifelong education: the XXI century*, *1*, 2-18.

Leontieva, O. V. (2009). Cultural and educational environment of the University as psychological and pedagogical problems. *Education and society*, *6*, 106-111.

Levin, K. (2000). *Field theory in social Sciences*. Moscow: The Sensor.

Levina, E. Y. (2015). To the problem of development management education: a stakeholder approach. *Kazan pedagogical journal*, *6*, 11-15.

Levina, E. Y., Yevgrafova, O. G., Derdizova, F. V., Zagladina, E. N., Levchenkova, T. V., Murugova, V. V., Blinova, L. N., & Anfilatova, O. V. (2016). Educational systems scenarios development in modern conditions. *International Review of Management and Marketing*, *2*(6), 76-81.

Manuilov, Y. S. (2002). *Environmental approach in education*. N. Novgorod: Publishing House of Volga-Vyatka Academy of State Service.

Ostroumova, E. N. (2011). Information educational environment of higher school as the factor of professional and personal self-development of the future specialist. *Fundamental research*, *4*, 37-40.

Privalov, A. N., Bogatyrev Y. I., & Romanov, V. A. (2017). Methodological approaches to organization of safe educational environment of the University. *Education and science*, *4*, 169-183.

Pugacheva N. B. (2010). Foresight as a component of the management of modern vocational education. *Professional education in Russia and abroad*, *1*, 65-69.

Robert, I. V., Panyukova S. V., & Kuznetsov, A. A. (2008). *Information and communication technologies in education: textbook for pedagogical*. Moscow: Drofa.

Sakhieva, R. G., Khairullina, E. R., Khisamiyeva, L. G., Valeyeva, N. S., Masalimova, A. R., & Zakirova, V. G. (2015). Designing a structure of the modular competence-based curriculum and technologies for its implementation into higher vocational institutions. *Asian Social Science, 11*(2), 246-251.

Shaidullina, A. R., Sinitzyn, O. V., Nabiyeva, A. R., Yakovlev, S. A., Maksimov, I. N., Gatina, A. R., & Akhmetov, L. G. (2015). Functions and Main Directions of Development of the Integrated Educational-Industrial Complex "College—University—Enterprise". *Review of European Studies, 7*(4), 228-233.

Shesternin, A. S. (2014). Informatization of education. Modern problems of information educational environment of informatization of studying process. The modern issues of informational education field. *The scientific journal of the Kuban state agrarian University*, *96*(02). Retrieved from http://ej.kubagro.ru

Slobodchikov, V. I. (2000). *About the concept of the educational environment in the concept of developing education*. Moscow: Akopiants ROSS.

Smirnova, M. N. (2012). Components of information educational environment and its functioning in the educational space of the University. *Education, Science, Innovation: the southern dimension*, *5*, 43-51.

Voogt, J., Fisser, P., Good, J., Mishra, P., & Yadav, A. (2015). Computational thinking in compulsory education: Towards an agenda for research and practice. *Education and Information Technologies*, *20*(4), 715-728.

Yarygin A. N., Aniskin, V. N., & Dobudko, T. V. (2014). The analysis of the main problems and features of modern information-educational environment. *Vector of science of Togliatti state University*, *3*, 343 -346.